Mr. Klar

Texas Highways

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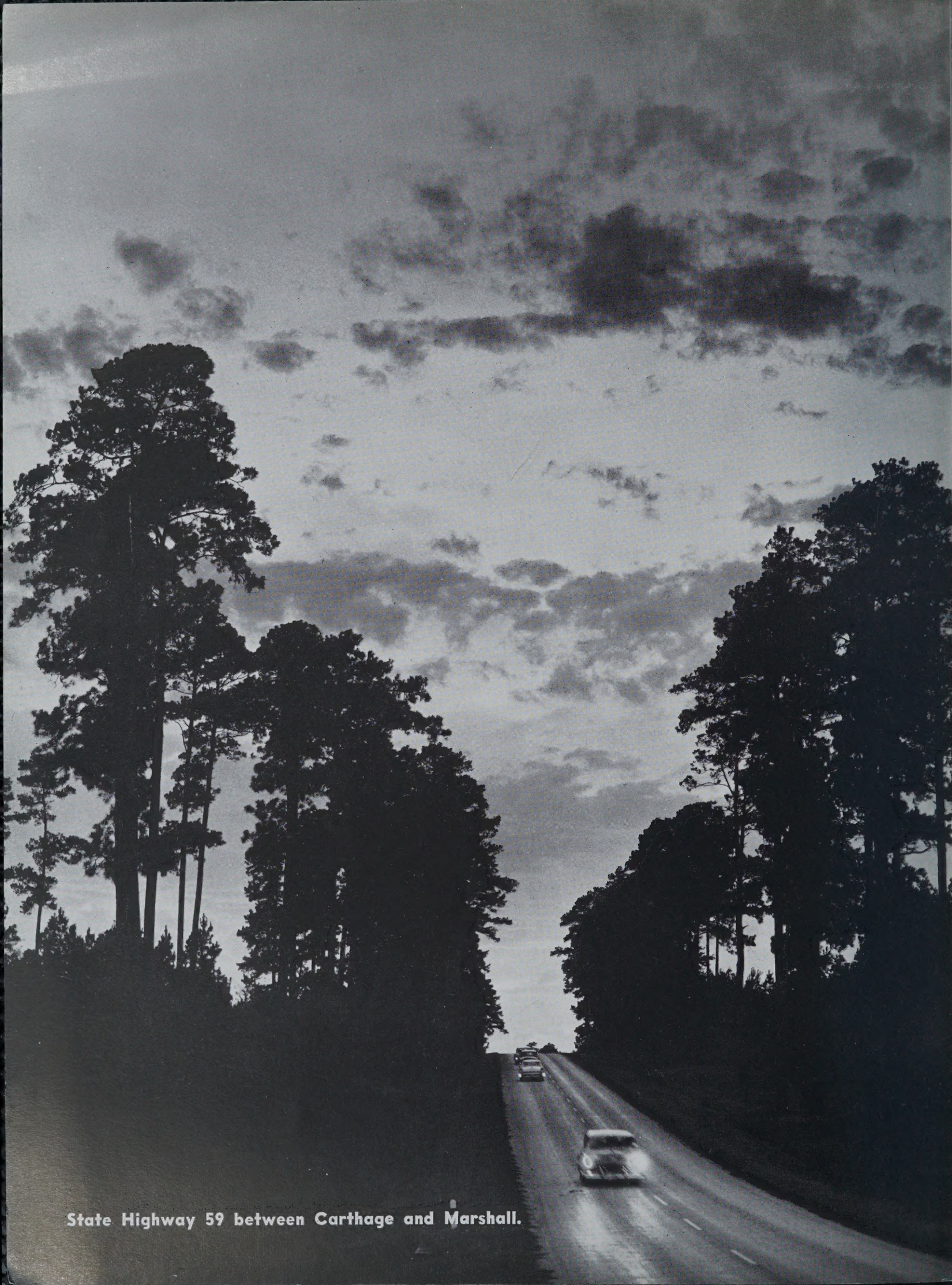

State Highway 59 between Carthage and Marshall.

Texas Highways

Volume 5 • Number 2

February, 1958

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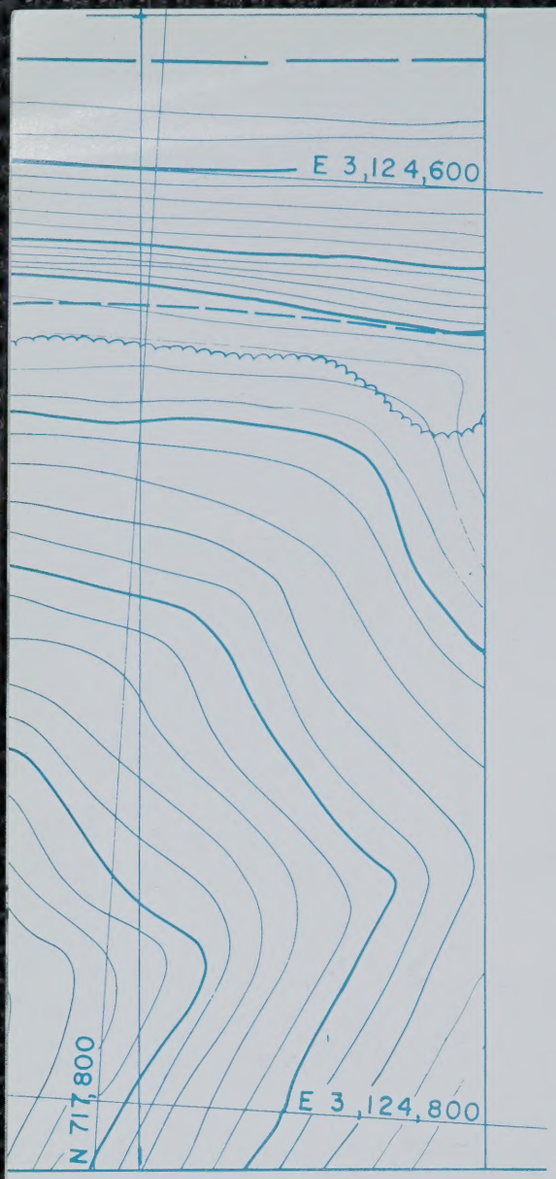


TEXAS COORDINATE SYSTEM

Ellis S. Allen, Designing Engineer
Houston Urban Project

TO anyone engaged in extensive surveying and mapping, the need for a system of coordinated control usually becomes apparent. The expression, "50 feet left of Station 236+25," refers to a coordinate position—although usually referenced to a center line or base line which will some day be difficult to locate. We have been provided with a state-wide plane coordinate system computed by the U. S. Coast and Geodetic Survey and tied to the National network of horizontal control, so why not use *it* instead of a meaningless arbitrary system?

The Texas Coordinate System is an application of the Lambert Conformal Conic Projection with two standard parallels. It represents the projection of the earth's spheroid in a cone which is then developed into a plane surface. Texas is divided into five zones to provide for a minimum scale distortion. The dividing lines of these zones are made to coincide with the nearest county line for convenience. However, the zones overlap sufficiently to permit working in adjacent counties in the same zone, even though one county may be listed in another zone.

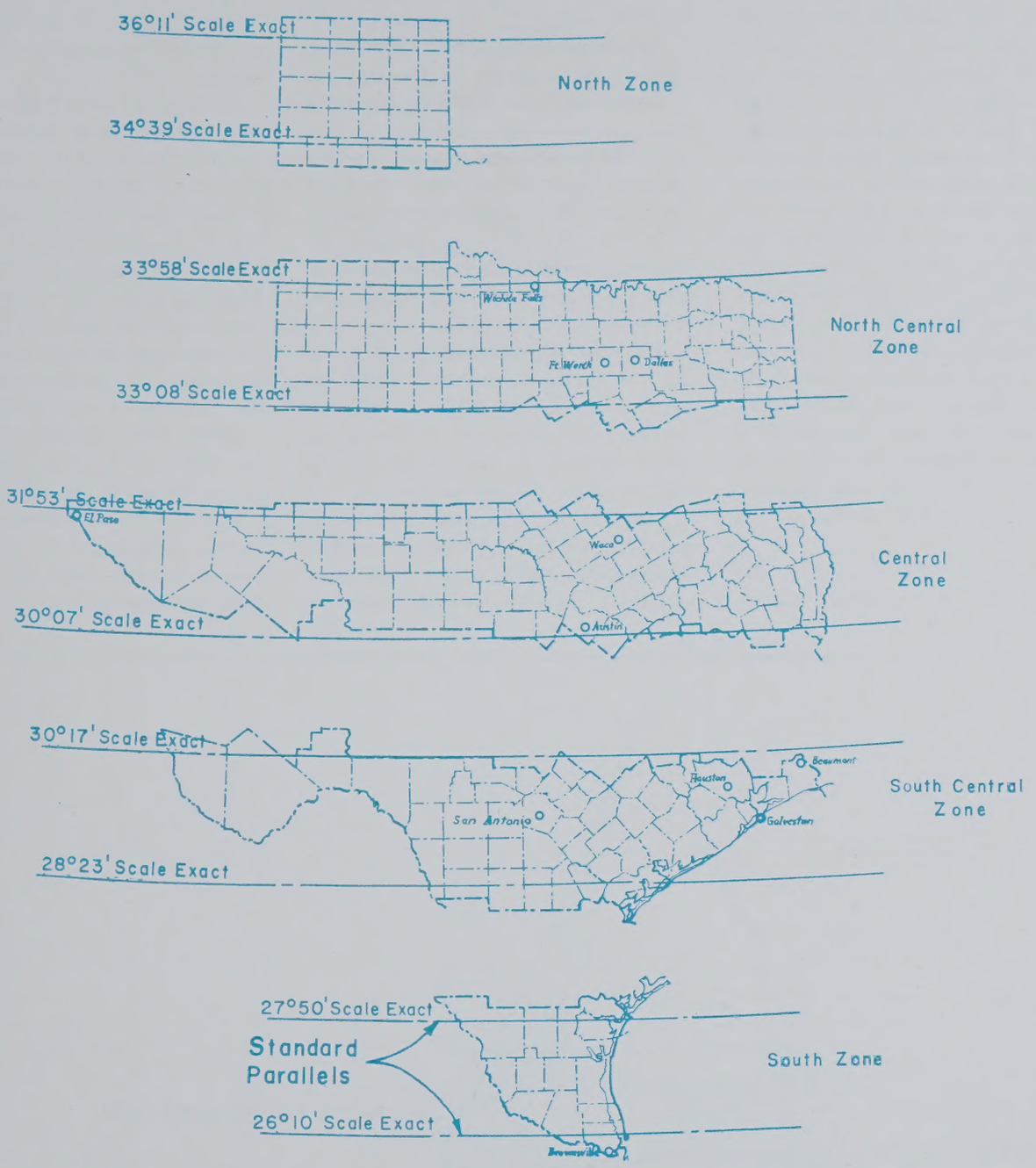
Map projections are necessary to show the earth's surface in a plane, just as it is impossible to flatten out orange peel without stretching or tearing it. A cone is constructed with the elements of the cone passing through two selected parallels of the earth's surface. Parallels are chosen which will provide the best coverage with a minimum of scale distortion. Elements of the earth's surface are then projected into the cone which is developed into a plane.

The Texas Coordinate System had its legal beginning with the passage of House Bill 657 by the Texas Legislature in 1943. This bill authorized the legal description of land to include a reference to a coordinate position, and defined the Texas Coordinate System. The system was developed and Plane Coordinate Projection Tables were prepared by the U. S. Coast and Geodetic Survey. It has done likewise for each of the other 47 states, using either the Lambert Conformal Conic Projection or the Transverse Mercator Projection, whichever was best suited to the shape of the state. In some cases, both systems were used in the same state (New York and Florida). The U. S. Coast and Geodetic Survey now publishes plane coordinates for all triangulation stations and some traverse stations of other governmental agencies.

There are distinct advantages to using the Texas Coordinate System for mapping and traversing. One is the possibility of being able to work in a plane surface without incurring undue distortion. Another is that all angles between intersecting lines or curves are preserved. Furthermore, the ratio of the length of a line on the earth's surface to the length of the corresponding line on the map projection is constant for a restricted locality. Calculations are carried out in the same manner of computing latitudes and departures as in any traverse computation.

Throughout the State of Texas, the maximum scale of distortion of the Texas Coordinate System is one part in 7,300, which is adequate for almost any mapping purpose. Distortion of scale due to printing or change in moisture content of the paper is often greater. For traversing, the scale of distortion is a known quantity and may be corrected, permitting traversing of first-order precision.

Often the surveyor or cartographer develops his own coordinate system, using an arbitrary origin, observing Polaris for north, and assuming the coordinate reference plane to be tangent to the surface of the earth at the



TEXAS COORDINATE SYSTEM ZONES

origin. With such a system, the farther one progresses from the point of origin, the greater are the errors of closure experienced in angles and distances. For instance, if one observed true north at one point, turned 90 degrees and traversed east for two miles and then established north by turning 90 degrees, the error incurred in assuming such direction to be true north would be approximately one minute. This value was computed for this latitude, and the error would be greater in more northern latitudes, due to the convergency of meridians. Thus, the true bearing of a line would constantly change, except for a true north-south line. However, in working in the Texas Coordinate System, the grid bearing of a line remains constant, its relation to true north varies, and this relationship is most easily computed, if desired.

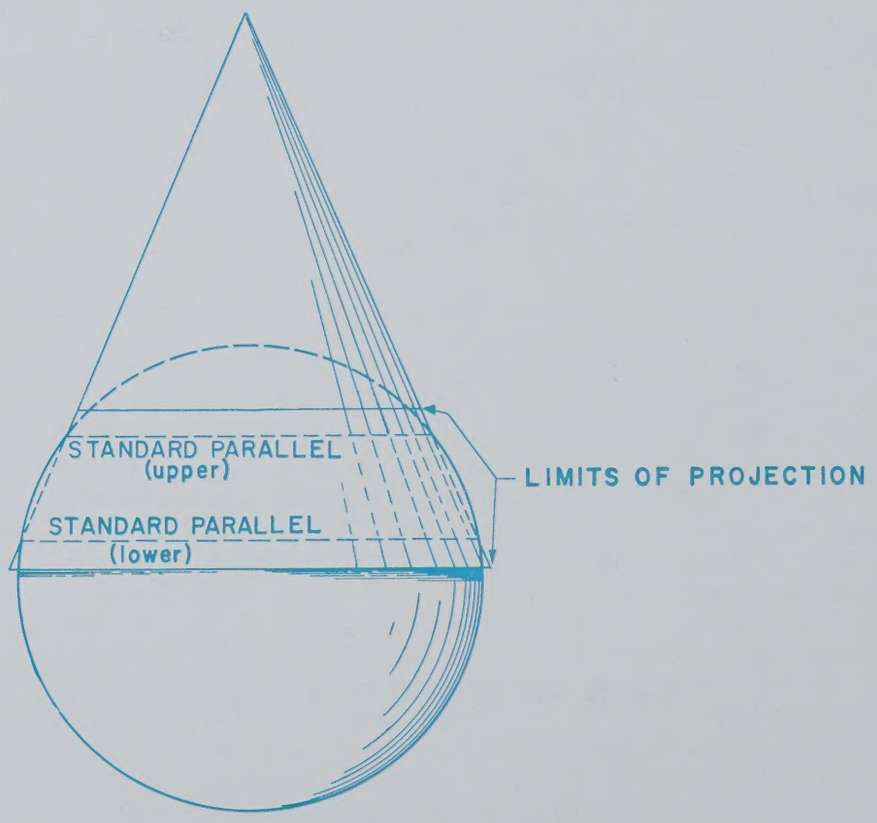
Thus, we are able to utilize the vast network of excellent control made available to us by the U. S. Coast and Geodetic Survey, without the complexity of using spherical coordinates. By tying both ends of a highway survey to triangulation stations and using the Texas Coordinate System, the accuracy of the traverse is determined and chaining blunders may be corrected, eliminating the need for bothersome equations when 100-foot chaining blunders are later discovered. By balancing the traverse, it is then possible to proportion the chaining error rather than have it accumulate, thus improving the survey.

A return on the investment of using the Texas Coordinate System is soon realized in making highway surveys and locations available to other agencies or individuals and in the exchange of information.

Recently, the Houston Urban Project office was asked to make available topographic maps which had been obtained through photogrammetric methods to the local office of the Corps of Engineers. These maps were of value to the Corps of Engineers only because they were plotted on the Texas Coordinate System and thus we were working on a common datum.

A mapping firm has made use of our highway base lines because coordinate positions had been computed, saving the firm and its customer in turn time and money. Since the Harris County Flood Control, The Corps of Engineers, The Houston Lighting and Power Company, and other mapping agencies use the Texas Coordinate System, exchange of information is greatly simplified and the taxpayer always benefits.

Often when information is desired on relocated bayous, drainage easements, transmission lines, or the location of a transmission tower, we are merely furnished a set of coordinates and a bearing and this always suffices for preliminary investigation.



LAMBERT CONFORMAL CONIC PROJECTION

Topographic map on Texas Coordinate System.

Since late issues of U. S. Geological Survey quadrangle maps include Texas Coordinate System grid ticks, it is a simple matter to orient oneself on quadrangle maps. In cases where only old quadrangle maps are available, geographic positions are easily computed from plane coordinates or vice-versa. Widely separated projects may be coordinated with assurance that the pieces will fit together with the use of this coordinate system.

It is perhaps in the field of right of way mapping and acquisition that the use of such a coordinate system is most beneficial. The enigma of the surveyor is the lost corner. Since most land grants in Texas were laid out in a crazy-quilt pattern, the retracing of land must be accomplished through recovery of original corners. These corners were generally rock piles, mounds, or stakes witnessed to bearing trees and all of these disappear with the ravages of time and the elements. Many of these corners have been relocated by surveyors only to be eventually lost again. In some cases, recovery of lost corners involves a great deal of time and expenditure of money.

If the coordinate position of a property corner is once established, its location is preserved forever, since a set of coordinates in a particular zone of a state defines only one point on the surface of the earth. The point may then be replaced or found from another point of known position such as a U. S. C. & G. S. triangulation station which has an underground mark in addition to the surface mark. In time of national disaster this would be invaluable in replacing lost corners. Through use of the Texas Coordinate System, bearings of lines take on a definite meaning, having a distinct relationship to astronomical north rather than an assumed value or relation to some defined line, the identity of which is known only to the mapmaker. These benefits are realized not only by the state but the property owner, adjacent property owners, and surveyors who will some day seek to retrace those lines.

Nothing is more important to the progress of an area than good, accurate maps. Unfortunately, only a small part of the state is adequately mapped by the U. S. Geological Survey. If coordinates were known on our highway system, any acceptable aerial photograph could then be used for map compilation, relieving the U. S. G. S. of the vast burden of obtaining ground control and speeding and economizing the mapping operations throughout the state. Such information would be invaluable to our Highway Planning Survey in the construction of county maps. So it seems that any added cost in coordinating our highways with the national network of horizontal control would be more than justified.

One of the frequent arguments against the use of the Texas Coordinate System has been the lack of triangulation stations in certain areas. The Federal Aid Highway Act of 1956 authorized the cost of establishing geodetic control markers along the proposed Interstate Highway System. The purpose of this is to provide an adequate system of horizontal and vertical control for mapping and construction surveys.

The U. S. Coast and Geodetic Survey is willing to provide personnel and equipment on a cooperative basis for this purpose. Such a system of control would, of course, provide coordinates of markers, and appreciably extend our network control, and it would be accessible to all persons engaged in surveying and mapping. Several states have already availed themselves of this excellent opportunity.

It is not necessary to elaborate on the mechanics of the Lambert Projection since this has been dealt with very thoroughly in publications written by members of the U. S. Coast and Geodetic Survey and published by the U. S. Government Printing Office. These publications are available at a nominal charge. The U. S. Coast and Geodetic Survey has available for the asking geographic positions, plane coordinates, and descriptions and locations of all triangulation stations.

The increasing availability of first- and second-order control and the simplicity of the Texas Coordinate System should eliminate the needless waste of good surveys run for highway purposes, which are subsequently abandoned after fulfilling an immediate need. Properly monumented and tied to the national network of control surveys, these highway surveys could serve the needs for numerous surveying and mapping operations. The need for resurveying a route when widening or altering would be eliminated. Property corners tied to the Texas Coordinate System are thus permanently preserved. For defense purposes, it would be invaluable to know positions of highways, intersections, and bridges.

With the increased mapping and surveying requirements of an expanding highway program and the use of photogrammetric mapping, the need for greater precision in highway surveying is increasing. The best way of determining the degree of accuracy of a survey is by running a closed traverse. By nature, a highway survey does not lend itself to closure upon the point of origin. Closure is best accomplished by beginning and closing upon a triangulation station. By use of the Texas Coordinate System, simplicity in calculations is maintained while working in a plane that has a definite relationship to the spheroidal shape of the earth. The Texas Coordinate System has proven itself a most valuable tool to the surveyor and mapper.

Publications Available Through the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

No.	*Title*	*Price**
235	"The State Coordinate Systems" (A Manual for Surveyors)	$0.45
252	"Plane Coordinate Projection Tables for Texas"	0.30
246	"Sines, Cosines, and Tangents Ten Decimal Places (0°-6°)"	0.20

*Subject to change.

Crain Named to Succeed McCarty

The man who holds the record for the longest service as a District Engineer resigned January 26 to assume new duties in Bangkok, Thailand.

Named to succeed S. C. McCarty, who served for 31 years as a District Engineer—the last sixteen in Lubbock—is Oscar L. Crain, former Assistant District Engineer at Bryan.

McCarty had completed 39 years with the Department at the time he resigned to work with the International Cooperation Administration.

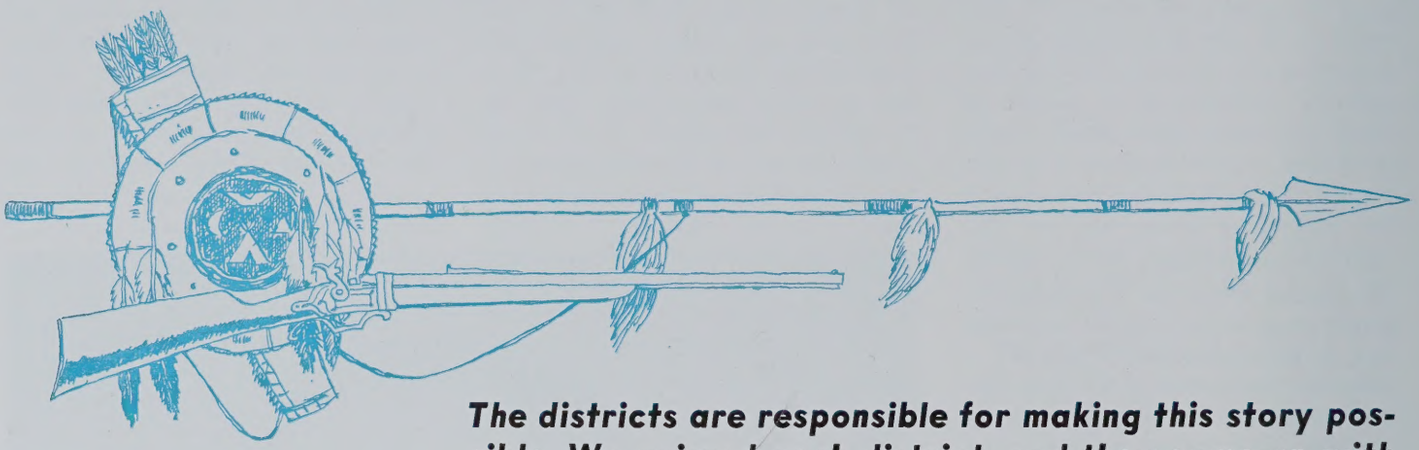
S. C. McCarty

O. L. Crain

Crain, a graduate of Texas A. & M. in civil engineering, is 49 years old. He started with the Department in 1932 as an Instrumentman in the Bryan District. Since that time he has worked as Paving Inspector, Assistant Resident Engineer, Resident Engineer, and Assistant District Engineer. During C. N. Parsons' illness, he served as Acting District Engineer in the Del Rio District.

Crain was born in Lone Oak, Hunt County, Texas, and attended public schools in Cumby and Sulphur Springs.

HISTORY ALONG



The districts are responsible for making this story possible. We quizzed each district, and they came up with enough material to fill an entire issue. Our special thanks to all involved for information and pictures—and their time.

ALL in a day's work of getting a road built, Texas Highway Department personnel have unearthed many artifacts — prehistoric, Indian, and Spanish. They have been turned up in borrow pits, gravel banks, and road sites. Creatures of the land and sea have not gone unnoticed either.

That same curiosity and vigilance responsible for most of the accidental discoveries of the past, whether archeological relics or caches of gold and jewels, has been exhibited by highway personnel. As a result of the interest shown by wide-awake road crews, relics of the past accidentally discovered in the course of road building are now on public view.

Two Indian skeletons unearthed nine miles west of Shamrock on U. S. Highway 66 by an alert road crew are now in the Smithsonian Institution in Washington, D. C. Several courthouse collections of prehistoric and Indian material have also been enlarged by Highway Department discoveries.

District 14 men exploring for base material pits to construct Ranch to Market Road 783 in Gillespie County uncovered the bones of a bison. Dr. E. H. Sellards, then Director of the Texas Memorial Museum, was notified and identified the bones as belonging to a species of a giant bison that lived some eight to ten thousand years ago.

A broken mastodon tooth and tusk were taken out of a sand and gravel pit in Borden County in 1954. The tooth, though broken, measures about fourteen inches, and is on display at the District 8 Laboratory.

A Falls County gravel pit yielded even more of a discovery. The top half of an elephant's head and a short piece of tusk were found in a pit six miles northwest of Marlin. These items are now in the Museum at Baylor University.

Finds in the Panhandle area were made in 1933 and 1936 when several state-sponsored WPA projects were undertaken. A large collection of prehistoric bones, small teeth, and tusks were uncovered by hand-loading gravel base. This collection was given to a University of Texas staff member.

Both collections were made from discoveries in pits along the North and South Wichita Rivers, and the Salt Fork of the Brazos River in Knox County.

These great animals had their human hunters, as is evidenced by the finding of the Folsom spear points in the same soil strata as the animal bones. For a long time the Folsom point makers have been considered the first residents of the New World (10,000 years ago), but some archeologists believe that human occupation began 25,000 years ago. These Paleo-Americans have left only scant evidence of their stay — chopping flints, scrapers, and projectile points. The earliest known projectile points, spearheads, have sometimes been found by Department personnel during road construction. Yet these spearheads, so very ancient, were not made until prehistoric man had lived a great many years on this continent.

Only two skeletons of great antiquity have been discovered in the United States. The first, famous in archeological circles as "Minnesota Minnie," came to light when a Minnesota road crew was digging through

OUR HIGHWAYS

a stratified clay and gravel deposit. For years she was queen of the ancients, until Texas discovered its own "Midland Minnie." Bone dates estimated for these ice-age beauties have been given from ten to fifteen thousand years.

So far, Texas Highway Department road crews have not unearthed any of the really ancient bones, but they have discovered a good many of the reasonably ancient bones of Indians of the Archaic Period (4000 B.C. to 1000 A.D.) and the Neo-American Period (before European cultures came to this country).

Estimating the age of bones, arrow and spear points, and pottery fragments, is not easy, even for a trained archeologist. However, spot finds may be given a rough date by knowing that the Indian did not have a bow and arrow until late in the Archaic Period. In the comparatively recent Neo-American Period, Indians made small, light arrow points, pottery, ceremonial objects, and built some earthworks for ceremonial purposes. It is in the uncovering of Indian burial mounds, and in the rough debris-laden middens that the Highway Department crews have uncovered the greatest finds and aided the local collections.

On Farm to Market Road 1845 at Graces Creek southwest of Longview, evidences of all three periods have been gathered. Dart points, grooved axes, fire stones, and hide scrapers were removed from the site.

Mounds and middens have been discovered by road crews in most sections of the state. A Brown County report discloses that an old Indian camping ground was discovered near Lampasas, and an Indian skeleton was uncovered when the highway bridge was built across the Colorado River at Winchell.

Karnes County road work has also revealed several Indian sites with various levels of culture. In one channel-widening project, a burial site was uncovered and two human skulls removed. One skull had an arrow in the base of it. The other skull had deer antlers on top of it.

Recently, survey parties in Gillespie County found a number of Indian mounds along the Pedernales River. It is not known whether anyone has actually explored these mounds.

In Kendall County, construction on Farm to Market Road 1892 north of Boerne led to the discovery of a large Indian mound. There was extensive digging in the mound after the right of way was purchased by the county, and before actual construction of the roadway. Great local interest was shown in the Indian relics, and as many as 20 and 30 amateur archeologists showed up to dig there day after day. It was not uncommon for one person to find 25 to 50 relics within a couple of hours. A large portion of the mound is still in existence.

In another part of this Kendall County area, Indian painting and drawings on a cliff were made accessible by the construction of the road. The paintings are near the Guadalupe River, two or three hundred yards downstream on the north bank from the F.M. 1892 crossing.

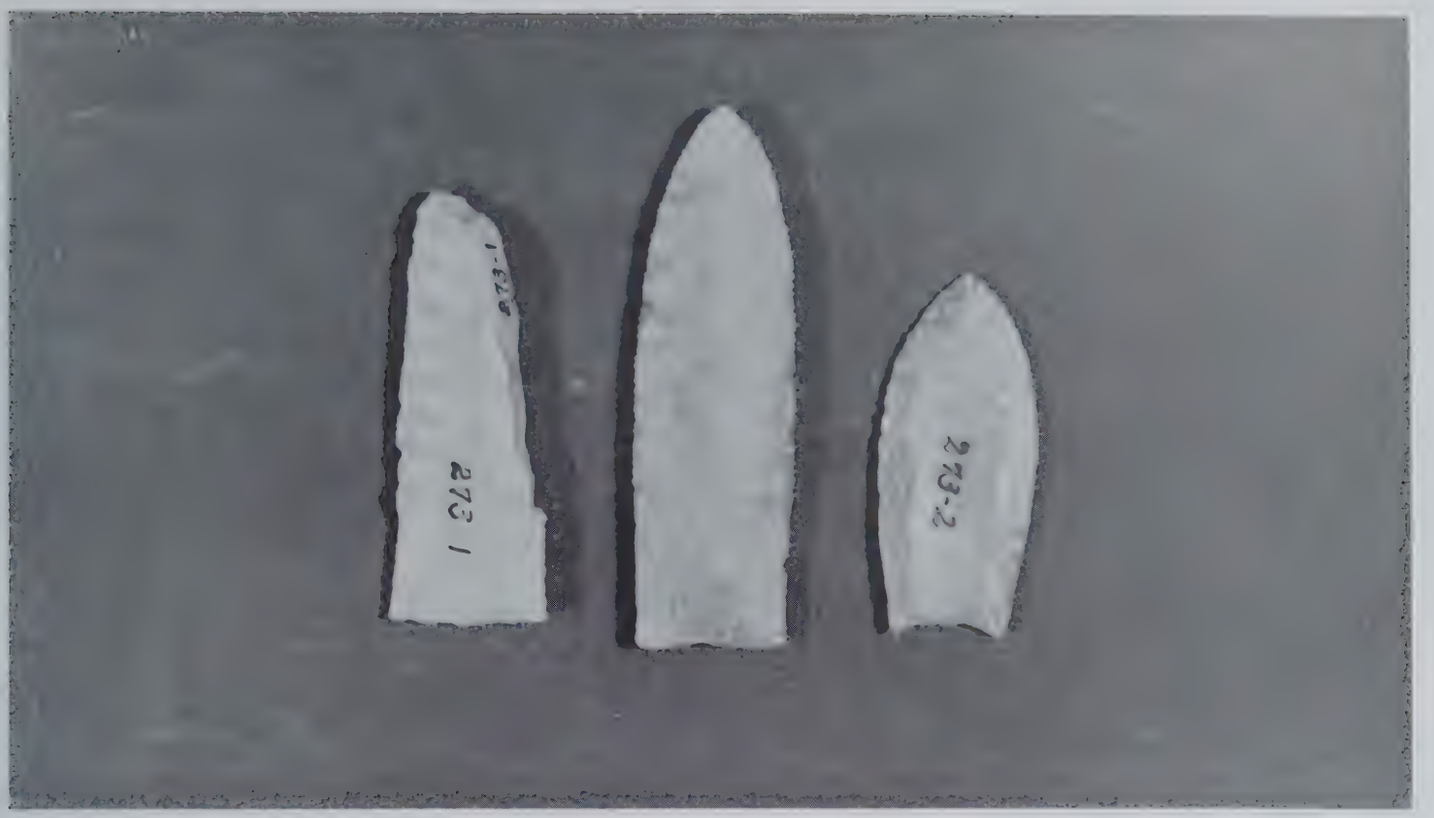
Famous Indian tribes such as the Comanche and Apache did not enter the Texas area until shortly before the Europeans arrived. The artifacts left by these tribes do not amount to much in comparison with those left by the older native tribes. Much has been learned about these older tribes from excavations around Spanish missions, where the early documents often give the names of tribes who lived near the settlements. South of

This rusty but comparatively well-preserved sword was unearthed by L. A. Holt, former Highway Department employee, eighteen years ago east of Woodville on U.S. 190. Historians believe that the 34-inch blade rapier bears out legends of early French and Spanish explorations in Texas. Some have guessed that the sword may be a relic of the ill-fated La Salle expedition.

State Highway 97 west of Floresville, on private property, is the ruin of one such old mission. A local legend of buried treasure has caused much digging in the area, and some of the holes are as big as the rooms of a house.

A relic of the days of the Spanish explorers was unearthed in construction work on U. S. 90 east of Woodville. A 300-year-old rusty, gold-hilted sword came to the surface after a scraper had removed about three feet of earth from the roadbed. The University of Texas was notified and sent an expert to the site who, in cooperation with the Highway Department, found other artifacts in the vicinity.

The Karnes County location of Farm to Market Road 887 at the Cavajal Crossing on Cibolo Creek is on the site settled by an early Spanish adventurer, Andres Hernandez. Not much is known of his background except that he arrived slightly before the time of the mission builders. Harassed by Indians, Hernandez



Just dig in, almost anywhere you are in Texas, and you'll come up with Indian relics. These projectile points—types found throughout the state—were dug up when Lubbock built its City Reservoir. On the left is a broken Yuma point; the middle arrowhead is a Folsom point; and right is a small Folsom point.

This Alto mound is in Cherokee County, a relic of prehistoric Caddoan civilization. The ceremonial mound is topped by a platform with thatched temple, similar to Aztec-Mayan style.

and his men dug crude caves in the high banks of the Cibolo, roofing them with growing grass and brush for concealment. When priests arrived in the area, a chapel and post were established. Cavajal was abandoned as a mission and outpost in 1737, but its stones are now incorporated into a farmhouse and outbuildings that occupy the original site. Excavation for F.M. Road 887 was through two of the old cave shelters; the rest have fallen in. Two Spanish sidearm blades were found during construction, one blade elaborately inlaid. Traces of the old trail to San Antonio de Bexar can still be seen in the area.

By far the most exciting discovery along the highways was made during construction of U. S. 75 south of Willis in November, 1941. The contractor was excavating a small cut area to provide material for an embankment a short distance away. Workmen noticed gold coins showing up after one piece of equipment had dumped its load on the fill.

Within the right of way six miles north of Brownwood on F.M. 2125 is an Indian grave, here being inspected by Billy J. Elliott, Instrumentman. He discovered an Indian skeleton there two months earlier. Note right-of-way fence in background.

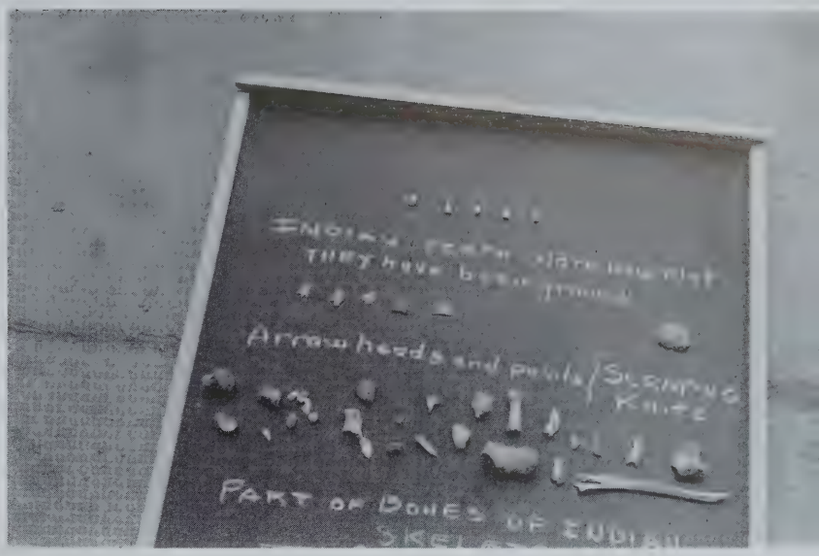
One mile north of the site where the Indian grave and artifacts were discovered on F.M. 2125, an Indian mound was opened with a bulldozer.

This monument, erected at the gravesite of Mr. and Mrs. Tom Mason, lies adjacent to the right of way on F.M. Road 1191 near Jermyn. The Masons were killed in 1858 by a band of Comanche Indians led by several white men. The single grave was less than twelve feet from the center of a county road when it was designatd as an F.M. road in 1955. To preserve the almost straight alignment of the existing county road, the grave was moved to its present location. It is cared for by Jack County.

W. E. Carmichael, District 12 Engineer gives a vivid recording of the day:

"There was quite a bit of scratching around to uncover other coins, and one of the Highway Department employees, Eugene Denton, who has since died, together with one of the

An almost perfect arrowhead, unearthed by rains, is pointed out on the very spot where it was discovered, 50 feet from the Indian grave. The other artifacts were placed for the photo but were found in the immediate vicinity.



More evidence of Indian Civilization. These were found laying on top of the ground and only your imagination will let you surmise what could be found in some of these locales if more extensive exploration were undertaken.

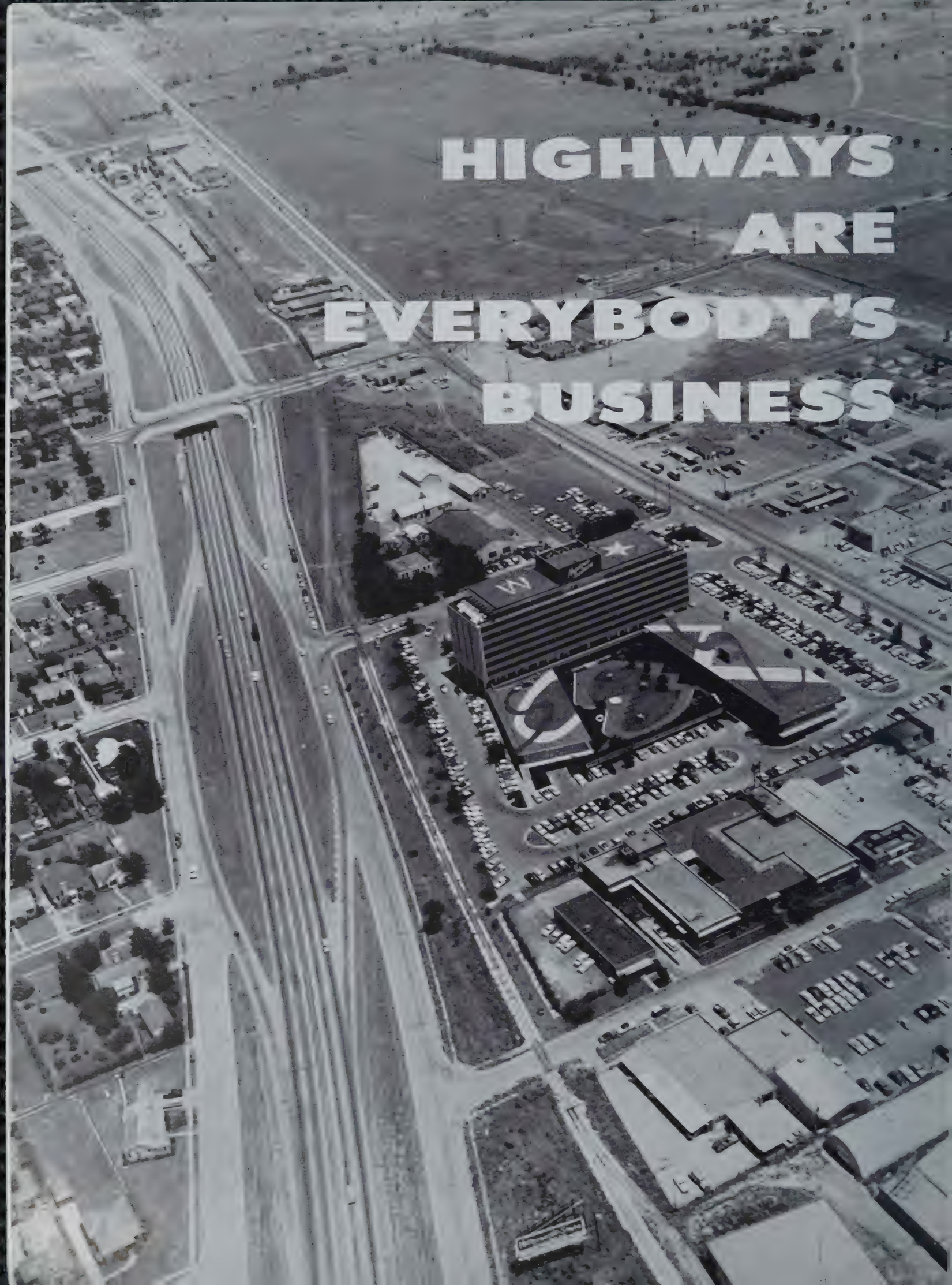
contractor's men, name unknown, decided to go to the point where the excavating equipment had picked up the load of soil. In doing this, they actually found the source of the money. It was divided into two stacks, one of modest magnitude, and the other of somewhat greater extent.

"Our job diary shows that Eugene Denton and Lindsey Lipscomb were the only two Highway Department employees on the job that particular day. I, personally, had been on the job most of the day every day except on this particular occasion. J. C. Dingwall from the District Office (now Assistant Highway Engineer) had picked me up early that morning and we had gone to Livingston to see some work under progress there. When I returned to the job, excitement had diminished. The facts in the case (about the loot) were never definitely established."

Today's alert highway road builders may not find a sack of gold, but the discovery of such a cache or at least some valuable artifact may be revealed just any day. After all, it has not yet been confirmed that Midland Minnie, a Texan, really is the oldest inhabitant of the North American continent. Watchful and curious road crews may some day unearth and present Minnie's mate to the modern world.

The backslope of U.S. 183, seven miles north of Brownwood, cuts a very clear cross section of one of the largest mounds disclosed, approximately 70 feet in diameter and 6 feet in height. Posts on top of mound are on right-of-way line. Elliott is pointing to bottom of blackened rocks.

This close-up view shows the mounds to be piles of blackened sandstone and flint rock.


HIGHWAYS
ARE
EVERYBODY'S
BUSINESS

Fred T. Bennett, Engineer
Information and Statistics Division

FOR uncounted centuries transportation — the movement of people and goods—has shaped man's destiny. Here in Texas and in America our pioneers pushed forward by water and trail, by wagon track, railroad, and highway to build a great nation.

Today we are pioneering again. We have started to construct a nationwide network of super highways that is revolutionary in concept. It will give a new freedom and a new speed to the movement of people and goods. It will stimulate business growth to an extent which staggers the imagination, and it will enrich the lives of every man, woman, and child in these United States.

This is the biggest public works program ever undertaken anywhere or at any time throughout the world. For the first time in highway history we are taking a long look into the future. We are designing and constructing a national highway system to handle the traffic volumes of twenty years from now, when more than 90 million motor vehicles are anticipated, as compared to today's figure of 65 million.

We shall crisscross the nation with 41,000 miles of interstate expressways. They will be divided highways of four to eight lanes, except in the lightly traveled stretches; but even in those, a minimum right-of-way area of 150 feet is to be secured for a double-track highway when traffic warrants. Overpasses and cloverleafs will eliminate intersections. It will actually be possible to drive coast to coast without encountering a stop sign.

Do not be misled by the word "interstate." These broad arteries will also go into and through our large cities, as well as around them, wiping out today's king-sized traffic jams and speeding up traffic on city streets.

From present indications, about 60 per cent of the Interstate System in Texas will be built entirely on new location, thus creating countless opportunities for business. Moreover, a prime purpose of the highway program is to support and encourage business development.

In the main, the proposed new highways will improve many types of business—in particular, the motels, restaurants, and gas stations. More people will be traveling; they will have to find places to eat, sleep, and service their automobiles. There will be no commercial facilities on the interstate route, but signs will alert the motorist when he approaches connecting roads leading to these facilities and the cities and towns he might want to visit.

An essential feature of these expressways is controlled access. The law prohibits the build-up of roadside businesses with a direct entrance onto the interstate highways, for this would defeat their whole purpose: namely, the safe and swift flow of traffic.

The more anyone studies the program and the case histories of numerous communities already in the area of current trunk lines, the more convinced he becomes that the benefits for all dispel any previous fear he might have harbored.

Competent surveys reveal that most of the through traffic forced to wend its way through our cities does not stop; but it does cause congestion, which discourages potential customers and deprives establishments in the business district of business they would otherwise enjoy.

The production, distribution, and acquisition of those things required for carrying out this huge highway program will mean a vast expansion of payrolls and purchasing power; and its effect should be felt even by the smallest of businessmen. It can be translated into terms of new homes, new furnishings, new cars, more recreation and travel, and the countless refinements that Americans are making a part of their everyday lives.

The highway construction and improvement to be effected by the present program should save nationally about $550,000,000 annually in vehicle operation costs alone. The experts estimate that adequate highways will save at least 2 cents per mile in travel expense. Thus, the motorist who drives 10,000 miles per year will save $200. This is not all clear profit, however, because these highways are being constructed by pay-as-you-go financing; and the added Federal taxes on gasoline and tires will cost the motorist about $8 per year, which will leave him a net profit of $192 annually in operating cost savings.

There are also other benefits that will be enjoyed by the highway user. For example, construction of the Interstate System to modern standards is expected to save 4,000 lives per year and to greatly reduce the number of persons injured and property damaged. Although a dollar value cannot be put on lives saved and the injury and suffering that will be prevented, it is expected that these new highways will result in an annual saving of at least $725,000,000 in accident costs alone. When this occurs, it is reasonable to expect that automobile collision and public liability and property damage insurance premium rates will fall.

It is estimated that savings of $825,000,000 annually will be realized by commercial vehicles in the saving of time as a result of the new highway construction. It is difficult to evaluate in terms of money what time is worth in non-commercial vehicle operations. However, the saving in time to all of us in driving to and from work, for recreation purposes, and for carrying on our daily activities has real value.

An example of measurable savings resulting from improved highways was recently proved by a large trucking company in New York, which reported that by using the New York Throughway it had achieved a safety record so good that its insurance cost was cut by $50,000 per year. On the old road it traveled prior to construction of the New York Through-

There will be no commercial facilities on the interstate route, but frontage roads lend to depth-type development such as this on U.S. 75 in Dallas.

way, the trucking company could recap only 30 per cent of its tires, but with the Throughway in operation, it now recaps 75 per cent. Clutch and brake maintenance has been cut in half; and because of better grades and easier curves of the Throughway, the trucking company can use lighter tractors and carry up to 1,500 pounds more pay load with less fuel consumption on every trip, all of which result in substantial reduction in operating costs.

The highway program offers a golden opportunity for cities and towns to coordinate urban rehabilitation and redevelopment with highway construction in eliminating blights and slums, and in halting the flight to the suburbs. Good roads, particularly expressways, bring the suburbanite residents to within shorter driving time of the downtown places of business and shopping center than it takes the city dweller to travel a much shorter but more congested route. This not only promotes the subdivision and development of new areas outside of the metropolitan centers and results in better and fuller utilization of land, but it preserves business and property values in the metropolitan central business district by making it more accessible. Expressways frequently open up new areas; and by minimizing the travel time between such areas and the metropolitan centers they transform otherwise low-value land into desirable residential, commercial, and industrial sites. Obviously, such extension of metropolitan limits results in greater land utilization and increases property value. This is particularly true in respect to land that is adjacent to, or in the vicinity of, the freeways. The modern highways that are already in operation and are a part of the new Interstate System are providing faster, safer, and cheaper travel and shipping services and greater job opportunities. Everywhere they have been synonymous with industrial and residential growth. From the analysis of the data obtained in the Gulf Freeway study, it can be concluded that the influence of the Gulf Freeway has been largely responsible for the following:

1. Downtown commercial properties along the four-street system increased in value several times faster than similar properties in other parts of the city. More large commercial concerns have been established in this area since 1945 than in any similar area in the city. Similar properties a few blocks away from the facility have also been favorably affected by the freeway although on a smaller scale. The effect appears to be lessening slightly now that the freeway has been opened through this area for eight years.

2. Low-cost, run-down residences

Land adjacent to expressways becomes more valuable because expressways make this land more easily accessible for commercial development.

along the freeway have been replaced by small businesses, light industries, and multiunit apartment buildings. The value of land along this portion of the freeway has increased considerably while similar properties in other parts of the city have had practically no change in value or use.

3. The value of vacant land within the study area along the Gulf Freeway has undergone a tremendous increase as compared to vacant land in other parts of the city. Those vacant tracts have been developed by light industries, shopping centers, new residential subdivisions, and multiunit apartment houses. Those tracts that remain vacant have either been purchased for development or are available at prices far in excess of their value prior to the construction of the freeway or the present value of vacant land in other parts of the city.

4. Restricted residential areas along the freeway have remained unchanged. There has been no change in land use, and property values have increased proportionately with similar properties in other parts of the city.

5. At the time the freeway was constructed through the integrated suburban center (Park Place), the value of land increased very rapidly as the displaced store owners re-established as near the facility and their previous sites as possible. Many new concerns moved in also. After the more desirable sites along the freeway had been taken, the activity slowed down and property values decreased slightly. However, a few blocks farther from the freeway there was an increase in activity and property values as new concerns started getting established on some of the thoroughfares leading to the freeway.

From the foregoing it can be concluded that the use and value of properties within the zones of influence of the Gulf Freeway were affected by their position relative to the facility. The effect varied with the type of land use prior to the construction of the freeway and with proximity to the facility.

FROM DENMARK TO TEXAS

Helping plan expressways for Wichita Falls Metropolitan Area is a young Dane whose dream of coming to America and working for an organization responsible for the construction and design of expressways has come true.

In the latter part of November, Vagn Egebaek and his wife Lonny arrived in Wichita Falls after a 48-hour flight from Copenhagen which included a one-day stopover in New York. The following day, he began his career as a Resident Designer with the Texas Highway Department, culminating a dream which began many year ago.

After graduation from the Danish Institute of Technology in 1948 with a Master of Science Degree in Civil Engineering, Vagn accepted a job with the City of Copenhagen in the Town Planning Division. His first three years were spent planning an underground transit system for the City. This period was interrupted by ten months service with the Danish army.

He was then assigned the task of helping plan an Expressway System for the metropolitan area. The results of this work were published as part of a Master Plan for the City of Copenhagen in 1954. After publication of the plan, the engineer worked on details for the proposed expressway system, and began studying those built in America. This led to his desire to come to America.

It was through Earl Williams, Wichita Falls Traffic Engineer, that the Highway Department learned of Vagn's aspirations. It took from February of last year, though, the date of the Department's first correspondence with him, to November, for this dream to become a reality.

Born in Vra, Denmark, February 6, 1925, Egebaek and his wife, whom he met at the University, are happily making a new life for themselves in Wichita Falls. However, their two children, Marianne, 8, and Ole, 7, are staying with their grandparents in Denmark until the end of the school year, when they too will fly to America and become Texans.

Vagn Egebaek, left, discusses the expressway system for the Wichita Falls Metropolitan Area with Bill Dickenson, right, Senior Design Engineer.

Avalanche Control in Colorado

In the rugged west of Colorado, they shoot to avoid killing.

ONE piece of equipment utilized by the Colorado Highway Department will probably never find its way into Texas highway equipment.

In their avalanche control program, Colorado boasts a 75 mm. howitzer to shoot snowslides. It's not as crazy as it sounds. Much study preceded the use of this method—one that is used in Austria and Switzerland to a large degree.

To quote Charles Shumate, Administrative Engineer in Colorado, "The shooting of a slide is done for two reasons: (1) If our records indicate that snow and wind conditions are reaching the point where a slide can be expected to run, the slide is shot with the 75 mm. shell in the hopes that we can bring the slide down and, of course, all snow removal equipment is parked and ready; (2) if the slide does not come with the first shot we then usually fire several more shots into the slide path area to stabilize the snow on the slopes and prevent its running later."

The Colorado Highway Department has been engaged in avalanche control study for more than five years. There are 27 mountain passes on Colorado's highway system, almost all above 10,000 feet in elevation. During the early days of the Department, no attempt was made to keep roads open in the winter through high passes. Today only six remain closed through the winter months, these because there is insufficient traffic to warrant snow removal.

Crewmen view the enemy before shelling begins. When the snow is not dislodged with one shot, several more are fired to stabilize the snow.

Photographs courtesy Colorado Highway Department

A danger spot located, the cannon is set up and loaded. The slide horizon and slide paths are indicated.

With increased traffic and demands for open roads the year round, the problem of snowslides became of paramount importance. Since the main highways have been kept open through the winter, ten persons have been killed by snowslides.

Through its study, Colorado is now able to determine when a snowslide can be expected. At such time, the highway is blocked off above and below the slide area, and the cannon is brought forth. Shells are fired into the snow mass at the point where the slide is expected to start. This gives a controlled slide. Otherwise, the highways would be open, traffic would be on the road, and King Snow would have full reign—able to roar down full force on motorists below.

The shell firing does not always bring down a snowslide, but if it doesn't, it generally stabilizes the snow, and traffic is allowed to pass until other conditions arise indicating a snowslide is imminent. If the expected happens, and the cannon

The shell explodes high up on the mountain in a black puff against the white snow background.

In this case, the snow came tumbling down with the first shot. Sometimes shelling with the howitzer does not dislodge the snow.

Excitement over, a crewman cleans the howitzer after the shooting. The rotary plow does away with the snow in short order.

Snow-removal equipment is standing by, and goes to work clearing immediately after the man-made slide.

firing starts the snowslide, snow-removal equipment is on hand to start clearing operations at once.

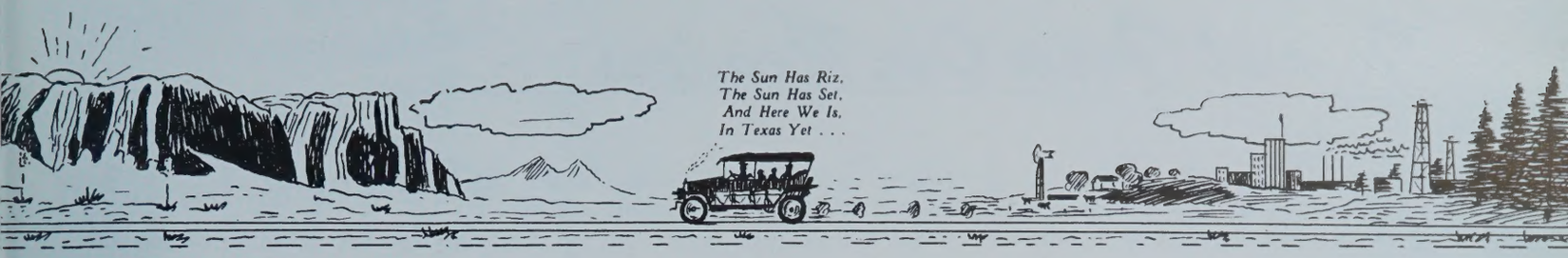
To determine when a slide is dangenerously near, Colorado uses the Swiss-developed Penetrometer. This instrument measures the resistance of the stability of snow layers. After stability is determined, they can figure about when the snowslide will occur. Some slides occur in the same spot year after year. These are easily controlled. They even have names. One, Brooklyn Slide, covers the highway for about a quarter of a mile with depths of from two to forty feet. It is those slides which break forth unexpectedly for the first time that cause the most trouble.

Most slides occur on slopes of 30 degrees or more in altitudes higher than 8,500 feet. The possibility of a slide depends on quantity of snow, the manner in which it falls, temperature, and wind velocity during and after a storm. Twelve inches of snow is the minimum depth necessary to precipitate a slide.

According to Shumate, "An average wind velocity of fifteen miles per hour or more, under most conditions, will tend to build a snow cornice at the crest of a ridge which in most instances is the beginning of a potential slide."

Slides occur as early as January and as late as April, but most of the larger slides are during February and March. Ordinarily, they follow slide paths, which, although bothersome, can't compare for problems with those slides which break forth in a new place. On paths where slides occur yearly, not much debris accumulates between slides, but where a new slide falls, it carries with it any rock, brush, trees, in its path. This debris plays havoc with snow removal equipment because it is generally hidden under the snow.

According to Colorado authorities, they would be glad to pass along this maintenance problem to Texas so we could have another "brag," but unfortunately, they must pile up snow in the winter to air condition Texas tourists in the summer.



OVER THE HIGHWAYS

Comments . . . from the Traveling Public

Mrs. Ward and I recently made an automobile trip from Statesville, North Carolina, to Abilene, Texas. Your very fine highways and highway facilities (parks, tables, trash and garbage receptacles, etc.) added much to our comfort, convenience, and pleasure. . . .

. . . At the Texas Highway Information Station in Texarkana, we noted that you have an ambassador of hospitality, good will, and general helpfulness in the person of Mr. Jack Harmon, as well as others with whom we talked on the return trip but whose names I do not have. Even Mr. Harmon's handshake registered favorably. It was not the hydromatic type —it had a clutch.

I might add that we were fortunate in missing floods and rains while in your great state. Congratulations and best wishes to the Texas Highway Department.

Ernest Ward, M.D.
Iredell, Texas

At the north end of ——, Texas, on Highway 75, there is a detour that has been there for six to eight months. This detour is a disgrace to the State of Texas.

For curiosity sake, I would sure like to know how many wrecks they have reported on this one-fourth to one-half mile of road.

This road is terrible every night, but on a rainy night it's a nightmare. . . .

Signed

We recently rode 1,500 miles on your wonderful highways after being out of Texas some years. Roads are our business—so we want to compliment the Texas highway on it's part in selling Texas. Roads like yours don't just happen. Your construction and maintenance departments are tops.

D. Whittenberg
Poteau, Oklahoma

On August 12 my family and I were on vacation to Colorado in a new 1957 Ford with a speedometer reading of less than 500 miles.

Between —— and ——, Texas, the main highway was under repair. In one spot along this stretch fresh tar had been put down. There was no warning whatsoever, no provision made to run on the shoulders out of the tar, nor were there barricades.

When we finally arrived at ——, my car was covered with this black coating and it cost me $7.50 to have this tar taken off my automobile. (Bill enclosed.)

I feel that the Highway Department was negligent in allowing cars to run through this repair work and I do not think that I am being unreasonable in requesting that the state refund me for the cleaning of my car.

I would appreciate your bringing this matter to the attention of the proper person.

Signed

We just completed a thirteen-state trip and noted with interest your state's roadside parks on Highway 90. Very commendable.

A. E. Wallace and family
Ontario, California

I have an idea that may save a lot of people's lives. What I have thought about is shock absorption bumpers for cars, trucks, buses, telephone poles, trees, bridge railing ends, underpass pillows and sides of underpasses, etc.

Shock absorption works for airplane landing gears and some airplanes land at better than 100 miles an hour. Automobiles use them for smoother riding.

I have written a letter to Henry Ford Jr. telling him about my idea. I am hoping he will do something in regards to motor vehicles.

I am writing this letter to the Texas Highway Department of Safety hoping something can be done about structures along streets and highways that cars, trucks, and buses sometimes hit. I think they might work for the front and sides of trains also (railroad) to bounce vehicles out of the way instead of wrecking and killing people.

I can't build these myself for I haven't the money to do it with. I am just passing this information to someone who might can do something about it.

Chester Phillips Jr.
Tyler, Texas

To and From Our Readers

The sun never sets on all the readers of TEXAS HIGHWAYS—at least at the same time. Highway engineers in Bolivia, Australia, Iran, India, Turkey, England, China, Brazil, Nicaragua, Thailand, and Egypt thumb through its pages each month to glean ideas that might be applicable to their problems. A magazine with both international and national circulation, TEXAS HIGHWAYS also goes to engineers and organizations in most of the other 47 states, and Washington, D. C.

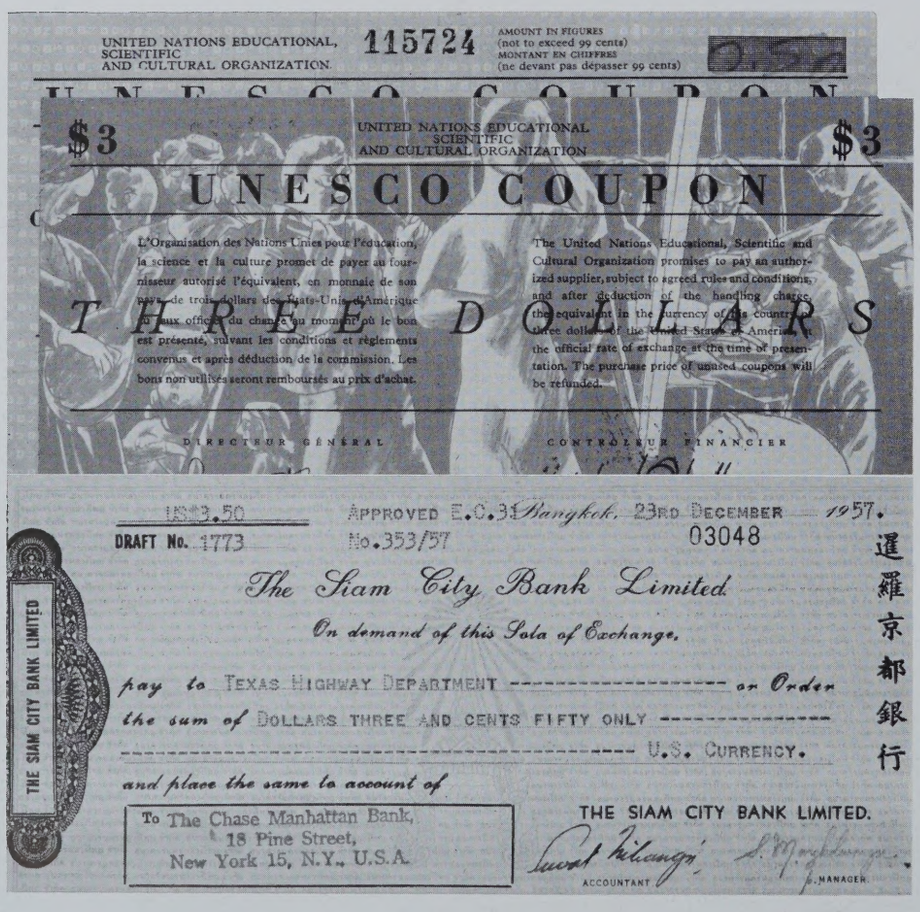
Shown here are subscription payments from two of our foreign clientele. One is from an engineer in Thailand, made on the Siam City Bank, Limited, to the Chase Manhattan Bank, New York. The other, from Egypt, is two UNESCO (United Nations Educational, Scientific, and Cultural Organization) coupons; one for $3; the other, 50 cents.

Thank you for sending me the Facts of Texas. I enjoyed reading them. I found out that Texas was so interested [*sic*] when I got it. I never knew that Texas had 500 lakes and 49 state parks. I think when I grow up I will get marry [*sic*] and will go to Texas for my honeymoon.

Carolyn Monks
Coloma, California

. . . Although the most of your magazine is somewhat technical, of course, it is well designed and a pleasure to look through. . . .

J. Conrad Dunagan
Monahans, Texas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About the Cover . . .

One spot of never-ending fascination is the Big Bend area of the state. It is not difficult when standing on such a threshold of space as this to visualize an Indian tribe riding up across the distance—or a prospector with his burro trudging the rugged wilderness. For solitude, grandeur, and dynamic beauty, there are few spots like it anywhere in the world.

For this month's cover, we get off the highway for a look at the scenery alongside State Highway 118. This area, known as Texas' painted desert, is near Study Butte on the west side of Big Bend National Park. Light yellows and reds blend with the deeper reddish-brown mountain in the background, and the rock formation in the foreground has a wine-red cast.

Incidentally, according to photographer Douglas Fairchild, the mountain peak which appears to be close by is more than twenty miles away from the spot on which we stand.

TEXAS HIGHWAY COMMISSION

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Texas Highways

TEXAS HIGHWAYS, official journal of the Texas Highway Department, is published in the interest of highway development in Texas and for departmental education in the improvement of construction, maintenance, and operation.

All material and manuscripts should be directed to the Editorial Office, Division of Information and Statistics, Texas Highway Department, Austin 14, Texas.

HIGHWAY SIDELIGHTS

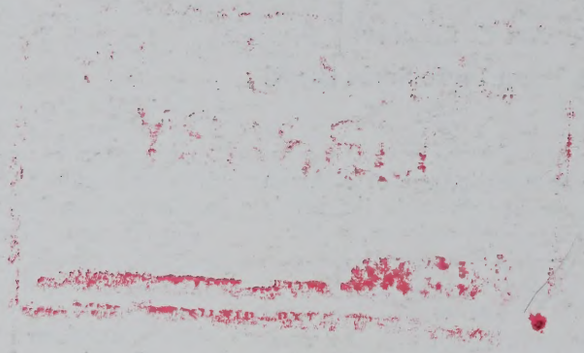
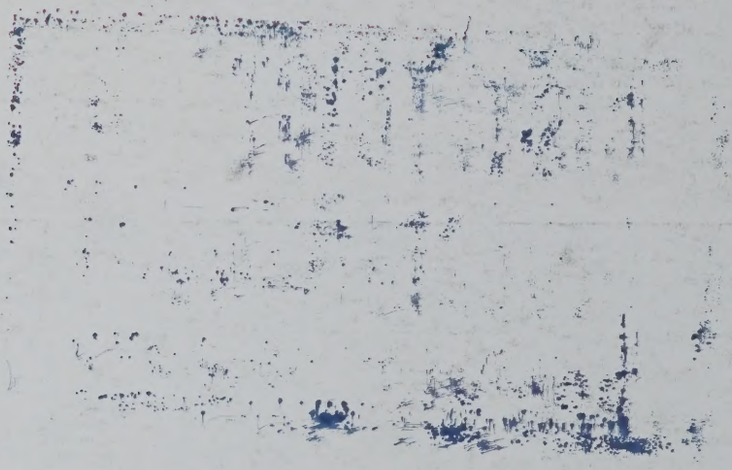
Gordon K. Shearer
Historian, Texas State Parks Board

Just off State Highway 225, the Houston-LaPorte road, is a place famed in Texas history. It is Vince's Bayou where Deaf Smith and six fellow scouts cut down a cedar bridge, trapping President-General Santa Anna of Mexico and Mexican cavalry fleeing from the battle of San Jacinto.

Destruction of Vince's Bridge is narrated in every history of the battle. General Sam Houston tells of its importance in his official report. Every school child is taught about it. Yet, it is probable that not one Texan in a hundred can locate it.

The San Jacinto Chapter, Daughters of the Republic of Texas, placed a granite marker at the site, one of eighteen that designate key points in the battle that won Texas independence.

Today, industrial Pasadena has grown up about it. Another wooden bridge spans the bayou at exactly the same spot, leading to a paper mill. The marker is in a mass of undergrowth, still visible from the bridge.

In dry weather, Vince's Bayou at this site was about 50 feet wide and ten feet deep. Heavy rains had made it wider and deeper on April 21, 1836. Part of the routed Mexican cavalry tried to escape by this route only to find the bridge gone. Some spurred their horses into the swollen stream; some dismounted and attempted to swim across. Pursuing Texans cut them down with a withering fire. Santa Anna also tried that route of escape. Another marker on Champion Paper Company property designates where he was captured.

In Pasadena, State 225 is routed over Sterling Street. Turn off at the intersection of Sterling and Richey Streets, and go to the north end of Richey Street to reach Vince's Bayou and the modern successor to historic Vince's bridge. The distance is a few hundred yards.